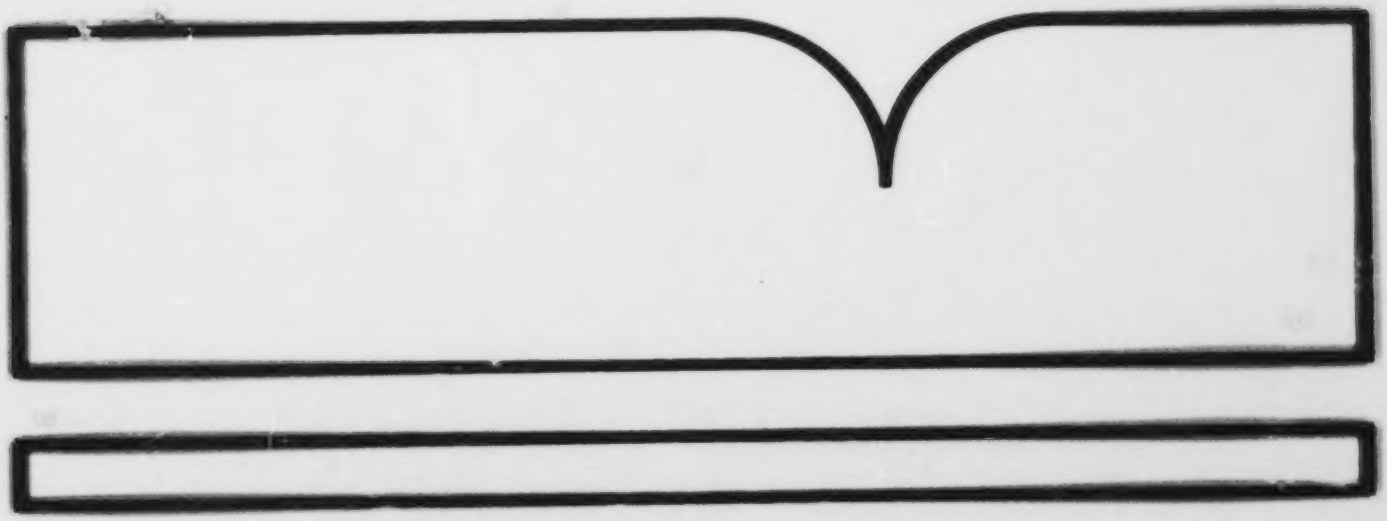
PB89-204762

Superfund Record of Decision (EPA Region 3) Palmerton Zinc Pile, Pennsylvania (Second Remedial Action), September 1988

(U.S.) Environmental Protection Agency, Washington, DC

29 May 88



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National Technical Information Service
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Environmental Protection
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Office of
Emergency and
Remedial Response

EPA/ROD/R03-88/063
September 1988

PB89-204762

EPA

Superfund Record of Decision:

Palmerton Zinc Pile, PA

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Palmerton Zinc site is composed of two locations in the Borough of Palmerton, Carbon County, Pennsylvania. Smelting operations have been conducted at two locations, a west smelter and an east smelter, flanking the Town of Palmerton, which is located at the confluence of the Lehigh River and Aquashicola Creek. Approximately 7,000 residents live in Palmerton, many of whom work at the smelting facility. Land use in the area is industrial, residential, and agricultural. The drainage pattern in the site area is toward Aquashicola Creek, designated a warm water fishery by the State of Pennsylvania, which flows into Lehigh River. Smelting operations were conducted in the west plant from 1898 to 1987, and in the east plant from 1911 to present. The site has had three owners, including the current operator, Zinc Corporation of America, and historically has produced zinc and other metals for a variety of products. Primary smelting of concentrated zinc sulfide ores, conducted until December 1980, resulted in the emission of large quantities of zinc, lead, cadmium, and sulfer dioxide. This air pollution caused defoliation of over 2,000 acres of vegetation in the vicinity of the east smelter. Between 1898 and 1987 process residue and other plant wastes (as well as municipal waste until 1970) were disposed of on Cinder Bank, a 2.5-mile, 2,000-acre waste pile located behind the east plant at the base of the Blue Mountains. Cinder Bank

(See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision
Palmerton Zinc, PA
Second Remedial Action
Contaminated Media: gw, sw, sediments
Key Contaminants: cadmium, lead, zinc

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

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16. ABSTRACT (continued)

contains approximately 27.5 million tons of leachable metals including lead, zinc, and cadmium, as well as carbonaceous material. Large blocks of residue crack and break off, allowing rapid infiltration of runoff during periods of rain and snow melt, resulting in contaminated leachate percolating down to the ground water and seeping out of Cinder Bank. This remedial action addresses Cinder Bank. Additional areas of contamination as well as ground water and surface water contamination will be addressed in subsequent remedial actions. The primary contaminants of concern affecting the sediments, ground water, and surface water are metals including cadmium, lead and zinc.

The selected remedial action for this site includes: slope modification, capping, and application of a vegetative cover on Cinder Bank; construction of surface water diversion channels; surface water and leachate collection and treatment using lime-activated filtration lagoons and/or constructed wetlands; implementation of an inspection, monitoring, and maintenance plan; and wetlands restoration measures, if necessary. The estimated present worth cost for this remedial action will be in excess of $2,861,800; however, the exact figure will not be known until agreement is reached on the extent of remediation during remedial design.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Palmerton Zinc Superfund Site - Cinder Bank Operable Unit
Borough of Palmerton, Carbon County, Pennsylvania

STATEMENT OF PURPOSE

This decision document represents the selected interim remedial action for this site developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), 42 U.S.C. Section 9601 et seq., and to the extent practicable, the National Contingency Plan, 40 C.F.R. Part 300.

STATEMENT OF BASIS

This decision is based upon and documented in the contents of the administrative record. The attached index identifies the items which comprise the administrative record. The Commonwealth of Pennsylvania has reviewed, commented and concurred with this Record of Decision.

DESCRIPTION OF THE SELECTED REMEDY

This innovative interim remedy focuses on the second of four separate operable units at the Palmerton Zinc Smelter site. The first operable unit, Blue Mountain, is in the remedial design phase while the remaining two operable units, the Valley soil contamination and the Area-Wide Groundwater and Surface Water Contamination, are both in the RI/FS phase.

The selected site interim remedy does ensure compliance with all ARARs and will be consistent, to the extent practicable, with those specified herein. The implementation of the selected capping and vegetation project will provide leachate reduction by way of influencing precipitation infiltration (in combination with contouring of slopes) and eliminate particle erosion thereby providing protection to the environment.

The selected interim remedy for the Cinder Bank consists of contouring the Cinder Bank to acceptable slopes, controlling surface water run-on and runoff, placement of a soil clay barrier and using a mixture of wastewater treatment plant sludge and fly ash as a substrate for vegetation. Pre-design studies will be performed to determine the best method of controlling or extinguishing the internal fires within portions of the Cinder Bank.

In addition, treatability studies will be undertaken with regard to the collection and treatment of surface water runoff from the Cinder Bank using constructed wetlands and lime treatment in conjunction with the already operational facility water treatment plant. The Cinder Bank run-off collection and treatment systems are needed initially since covering the Cinder Bank may take at least three years. Surface water run-on to the Cinder Bank from Blue Mountain will be controlled by the construction of surface water diversion channels.

Operation and Maintenance will be implemented for this Operable Unit once it has been demonstrated that treatment discharge, if necessary, to the Aquashicola Creek meets the clean-up goals in the attached Record of Decision. This is in conformance with Section 104 (c)(i)(6) of CERCLA, 42 U.S.C. Section 9604(c)(i)(6).

The general procedures for the above described remediation will be as follows:

Step 1: Contour Slopes of Cinder Bank

Slope modification is required to enhance precipitation runoff from the Cinder Bank and reduce the amount of precipitation infiltration and particulate erosion. Heavy equipment will be used to modify slopes targeted for vegetation. Excessively steep or otherwise unstable slopes may be built-up from the toe of the slope. Gas vents will be installed, if necessary. The Remedial Design generated prior to the implementation of this interim remedial action will provide grading specifications necessary to ensure success in the final cap placement.

Step 2: Construction of Surface Water Diversion Channels

Surface water diversion channels will be constructed, which will assure the water run-off from Blue Mountain will be diverted away from the Cinder Bank area. During construction of the remediation action surface water run-off from Blue Mountain will be diverted through channels away from the Cinder Bank and to a treatment

system if warranted. Leachate from the Cinder Bank will be collected by channels and diverted to the treatment system. Initially, lagoons in compliance with RCRA standards, will be utilized for the temporary storage of collected surface water.

Step 3: Construction and Cap

A cap consisting of a minimum of 18" of soils and 6" of clay or soil/bentonite mixture will be placed over the Cinder Bank to prevent: 1) infiltration and leaching of heavy metals into the groundwater; and 2) seeps contaminated with heavy metals from exiting the toe of the Cinder Bank. (See Alternative selection for further discussion).

Step 4: Vegetative Cover

A stabilizing vegetative cover will be applied over the cap. The cover may be comprised of a wastewater treatment sludge/ flyash mixture, or conventional mulching, fertilization and seeding. The purpose of the vegetative cover will be to stabilize the slopes, prevent erosion, and control surface water movement.

Step 5: Long-Term Activities

An inspection, monitoring, and maintenance plan will be implemented to assure effectiveness of the remedy.

Declaration

The selected remedy is protective of human health and environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective as set forth in Section 121(d) of CERCLA, 42 U.S.C. Section 9621 (d), and Section 300.68 of the NCP. This remedy satisfies the statutory preference as set forth in Section 121(b) of CERCLA, 42 U.S.C. Section 9621(b), for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element. Finally, it is determined that this interim remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Because this interim remedy will result in hazardous substances remaining on-site, a review will be conducted within five years after commencement of remedial action to ensure that this interim remedy continues to provide adequate protection of human health and the environment.

6-29-88
Date

James M. Seif
Regional Administrator

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for
Decision Summary

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APPENDIX B. - RESPONSIVENESS SUMMARY

Palmerton Zinc Site
Operable Unit II
Cinder Bank

I. Introduction

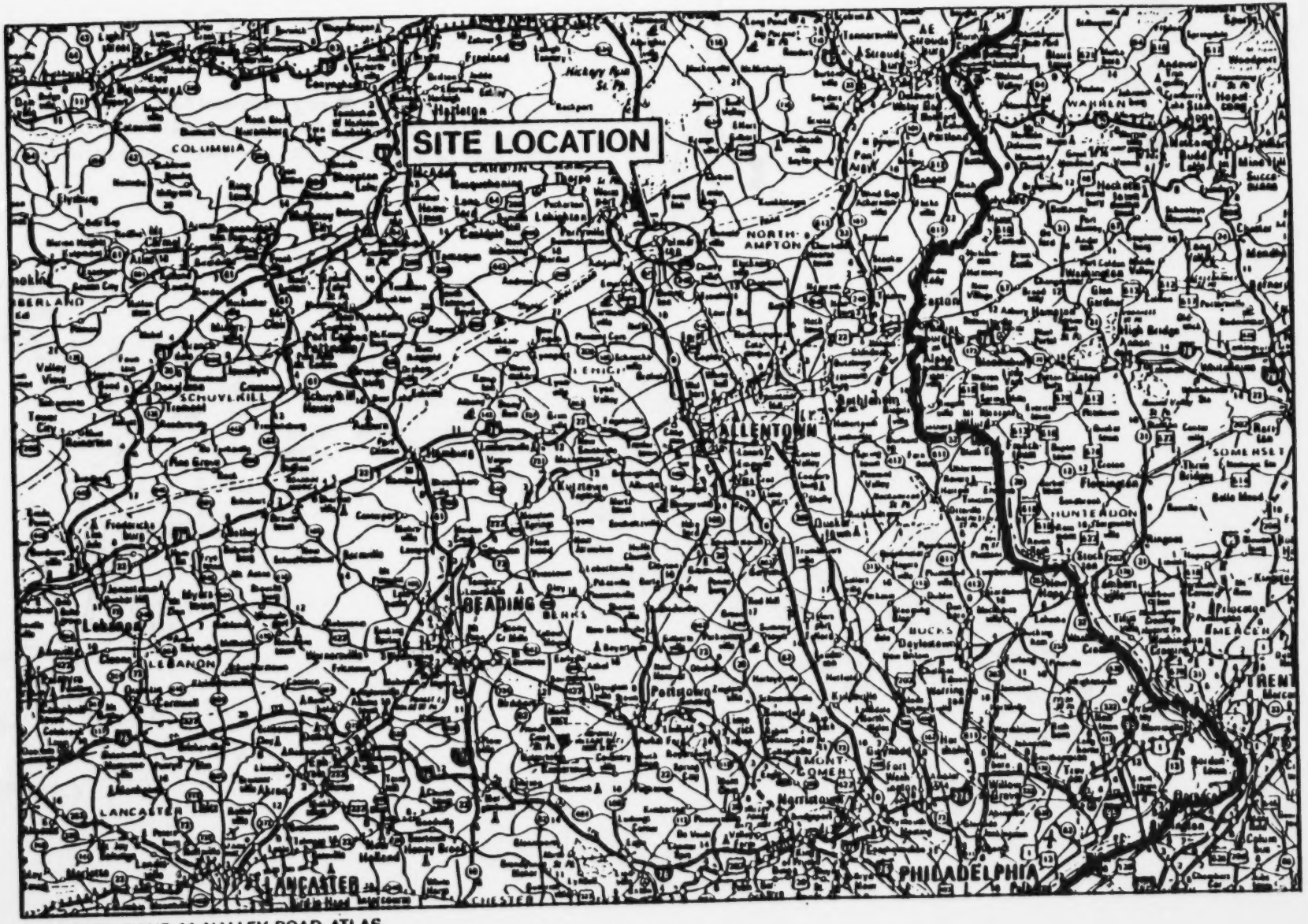
The Superfund investigation of the Palmerton Zinc smelter focuses on four problem areas which are each being studied as individual units: first, the deposition of heavy metals, mainly cadmium, lead, and zinc, throughout the valley as a result of air emissions from the smelter; second, the Cinder Bank, approximately 2.5 miles long, which consists of an estimated 33 million tons of slag; third, the defoliated portions of Blue Mountain next to the smelter; and fourth, the overall site groundwater and surface water contamination. The investigation of the Cinder Bank, which is located on the smelter property and at the base of Blue Mountain, is the subject discussed herein. The Blue Mountain unit has recently entered the design phase, while the Valley and groundwater/surface water units are in the Remedial Investigation and Feasibility Study phase.

II. Site Name, Location and Description

The Palmerton Zinc Superfund Site is located in the Borough of Palmerton, Carbon County, Pennsylvania as shown on Figure 1. The town is situated at the confluence of the Lehigh River and Aquashicola Creek, just north of the Lehigh Water Gap. Land uses in the area include industrial sites, forest lands, residential communities and agricultural farmlands. Approximately 7,000 residents live within the town which has historically provided a majority of the workforce at the smelter. From 1898 to 1967 the smelter was privately owned by the now defunct New Jersey Zinc Company. It was then sold to Gulf & Western Inc. which operated the facility until 1981, when it was purchased by its current owner Zinc Corporation of America.

The topography surrounding the site is mountainous, lying in a deep valley within the Appalachian Mountains between Blue Mountain (elevation 1,500 feet) and Stony Ridge (elevation 900 feet). The Appalachian Trail runs along the top of Blue Mountain.

The smelting operations are located at two separate locations, a west smelter and an east smelter. Both smelters are located at the base of Blue Mountain (see Figure 2).



SOURCE: RAND McNALLEY ROAD ATLAS

Figure 1

SITE LOCATION

PALMERTON ZINC SITE, PALMERTON, PA

SCALE: 1" - 95040'

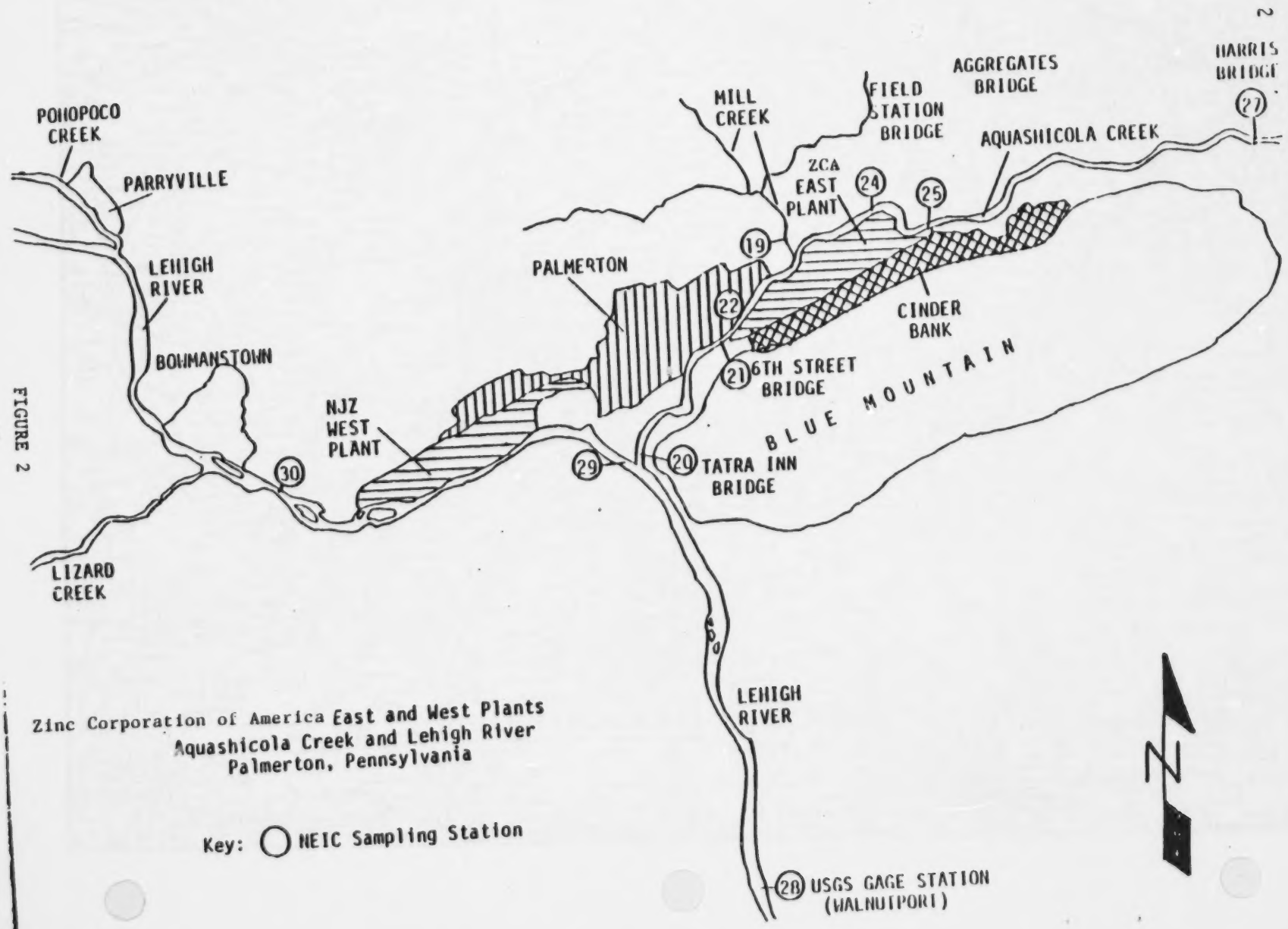


FIGURE 2

Zinc Corporation of America East and West Plants
Aquashicola Creek and Lehigh River
Palmerton, Pennsylvania

Key: ○ NEIC Sampling Station

The major watercourse in the project area is the Lehigh River. The drainage pattern of the study area is toward Aquashicola Creek, a tributary of the Lehigh River. Aquashicola Creek flows through a buried valley, between Blue Mountain on the south and Stony Ridge on the north. The creek flows southwesterly and is joined by Buckwha Creek about one-half mile upstream of Harris Bridge and by Mill Creek near the east plant's main gate (See Figure 2). Aquashicola Creek flows into the Lehigh River approximately 1.5 miles southwest of the east plant.

The reach of Aquashicola Creek in Palmerton is classified as a warm water fishery and is stocked for trout by the Pennsylvania Department of Environmental Resources. According to the criteria of water uses in this classification, the creek should maintain stocked trout from February 15 to July 31. It should also maintain and propagate fish species and additional flora and fauna that are indigenous to a warm-water habitat.

A water intake is located on the Aquashicola Creek near the Field Station Bridge. This intake pumps water from the stream for industrial use at the east plant. Water from Aquashicola Creek is also pumped from an intake located between the Main Gate Bridge and the Sixth Street Bridge during times of emergency need for industrial process water.

Groundwater in the site vicinity occurs in both the unconsolidated deposits and the underlying bedrock. The shallow aquifer is classified as a Class 3 aquifer and the deep aquifer is classified 2a as determined by EPA Groundwater Classification Guidelines.

At the foot of Blue Mountain, the Palmer Water Company, which supplies water to the towns of Palmerton and Aquashicola, has as its water source four production wells, ranging in depth from about 200 feet to more than 400 feet, drawing ground water from bedrock. The yield of these wells reportedly ranges from 115 to 130 gallons per minute.

III. Site History

The Zinc Corporation of America currently operates one zinc smelter in Palmerton, referred to as the east plant, which opened for operation in 1911. Another smelter located in the west plant had operated between 1898 and 1987 at which time it was shut down. The Palmerton Zinc facility historically has produced zinc and other metals for machinery, pharmaceuticals, pigments, and many other products.

Primary smelting of concentrated zinc sulfide ores, which was the main source of air pollution, was stopped in December of 1980. However, until then the smelters had emmitted large quantities of zinc, lead, cadmium and sulfur dioxide which caused to the defoliation of many acres of land including approximately 2,000 acres on Blue Mountain, located adjacent to the east smelter. Aerial photography of the site taken from 1938 to 1985 shows the various stages of damage to vegetation. Vegetation damage is defined as areas of exposed rock and soil where the original vegetation, as seen on a 1938 aerial photgraph, has been destroyed as a result of the smelter's emissions.

Vegetation damage first appeared on a 1951 aerial photograph as isolated patches on the steep, north-facing slope of Blue Mountain, located immediately south of the Palmerton Zinc east plant. During the 1938-1985 period of analysis, the vegetation damage progressed and additional areas of damage appeared. By 1985, vegetation damage appeared as a continuous, widespread area with barren, eroded land visible in aerial photographs.

The disposal of plant waste since the smelter operations began at Palmerton in 1898 has enabled the Cinder Bank to be built to its present dimensions of 2.5 miles and 33 x 10^6 tons. It contains large amounts of leachable lead, zinc, cadmium, and other metals.

IV. Enforcement History

Past zinc smelting operations have created widespread heavy metal contamination both on and off the Palmerton Zinc plant property. The contaminated areas have been divided into four distinct areas by EPA and are referred to as the Blue Mountain Project, the Cinder Bank, the Valley Contamination and overall groundwater and surface water contamnation. An RI/FS for the Cinder Bank has recently been completed by the Zinc Corporation of America who, as the current owner of the facility is a potentially responsible party (PRP) at this site. The Valley Contamination Study is currently being performed under a Consent Order by Gulf and Western, the other PRP associated with this site. Both PRPs declined participation in the Blue Mountain RI/FS which was completed by EPA in April, 1987.

In a letter dated June 10, 1987, EPA gave the PRPs notice of their potential liability with regard to the implementation of the Blue Mountain Project remedial action. Enclosed with this letter was a copy of the completed RI/FS and a copy of EPA's proposed remedial alternative. The PRPs were extended the opportunity to present a good faith proposal to conduct

the Remedial Action to the Agency within sixty (60) days of receipt of the June 10, 1987 notice letter. EPA received a proposal from ZCA and completed successful negotiations in which ZCA, by means of a Consent Decree agreed to implement the Blue Mountain ROD. Gulf and Western Inc. again declined participation in this project.

V. Site Characteristics

A. Geology/Hydrogeology

1. SURFACE WATER

The drainage pattern of the study area is toward Aquashicola Creek, a tributary of the Lehigh River. Aquashicola Creek flows through a buried valley, between Blue Mountain on the south and Stony Ridge on the north. The creek flows southwesterly and is joined by Buckwha Creek about one-half mile upstream of Harris Bridge and by Mill Creek near the east plant's main gate. Aquashicola Creek flows into the Lehigh River approximately 1.5 miles southwest of the zinc plant.

The reach of Aquashicola Creek in Palmerton is classified as a trout-stocking stream by the Pennsylvania Department of Environmental Resources.

A water intake is located on the Aquashicola Creek near the Field Station Bridge. This intake pumps water from the stream for industrial use at the east plant. Aquashicola Creek water is also pumped from an intake located between the Main Gate Bridge and the Sixth Street Bridge during times of emergency need for industrial process water.

2. GROUND WATER

Groundwater in the site vicinity occurs in both the unconsolidated deposits and the underlying bedrock. The glacial outwash deposits in the stream valley contain significant variability typical of this type of deposit.

Bedrock in the site area also contains significant quantities of groundwater. The intense deformation of the bedrock is expected to occur through interconnected fractures and in related solution openings in the limestone formations. The degree of interconnection between the unconsolidated and bedrock aquifers and their relationship to nearby surface waters has not been defined to date, but is being investigated.

At the foot of Blue Mountain, the Palmer Water Company, which supplies water to the towns of Palmerton and Aquashicola, has as its water source four production wells, ranging in depth from about 200 feet to more than 400 feet, which draw groundwater from the bedrock aquifer. The yield of these wells reportedly ranges from 115 to 130 gallons per minute.

The depth to groundwater in the valley is reported to be about 5 feet. The flow directions of shallow groundwater are expected to be controlled by local topography and by Aquashicola Creek. Shallow groundwater may flow north from Blue Mountain to the creek. Wells installed in the unconsolidated deposits near Aquashicola Creek may receive substantial recharge from the creek. Deeper groundwater flow may be influenced primarily by both structural and stratigraphic relationships. Furthermore, deep groundwater will likely flow from the site toward the Lehigh River, to the west-southwest. The groundwater flow patterns are also being investigated.

3. Soils

The bedrock of Blue Mountain is Silurian-aged Shawangunk Conglomerate, ranging from a quartzitic sandstone to a coarse conglomerate. To the south is the Ordovician Martinsburg Shale, and, to the north, are red siltstones and shales interbedded with limestone and sandstone in the Bloomsburg (Cayuga) formation.

All of Carbon County was glaciated by the Kansan Glacier. The second, or Illinoian, glacier extended into the valleys to the north and south of Blue Mountain, but apparently did not cover the ridge itself.

The periglacial frost action during the Illinoian and Wisconsin glacial periods resulted in shallow channery soils on most ridges with deep deposits of colluvial material at the bases.

B. Extent of Contamination

1. Cinder Bank

A. Nature of Cinder Bank Wastes

Much of the Cinder Bank residue is in the form of briquettes from the vertical retorts and contains residual metals and carbonaceous material. As a result of either incomplete quenching or spontaneous combustion large portions smolder continously and several of these areas are posted as "Fire Areas." In areas that have not been physically disturbed, large cracks form in the surface roughly parallel to the outer edge.

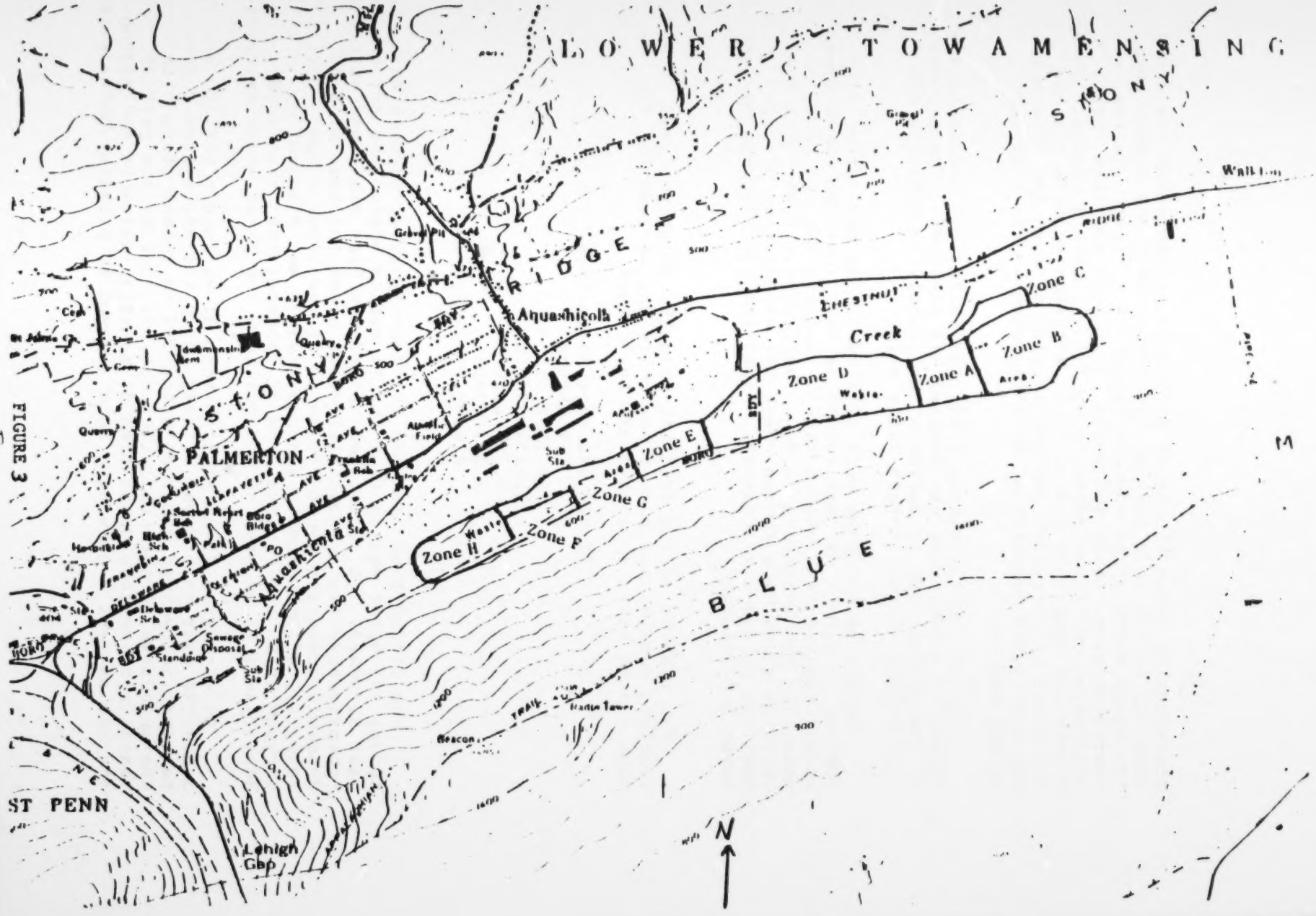

LOWER TOWAMENSING
STONY
RIDGE
Aquashicola
Creek
Zone A
Zone B
Zone C
Zone D
Zone E
Zone F
Zone G
Zone H
PALMERTON
BLUE
ST PENN
Lehigh Gap
N

FIGURE 3

Occasionally large blocks of partially consolidated residue come off of the main mass of the Cinder Bank and tumble down the steep north slope towards Aquashicola Creek. As the cracks develop, steam and smoke issue from them leaving sublimated yellowish deposits on the adjacent surfaces. These cracks and resulting broken rough surfaces provide avenues for rapid infiltration and percolation of rain and snow melt, and facilitate leaching of soluble constituents from the Cinder Bank.

In 1981 approximately 1,800 linear feet of reside in the Palmerton cinder bank was sampled and analyzed. The purpose of the project was to define as accurately as possible the recoverable values in this waste pile.

Twenty-seven holes were drilled by the New Jersey Zinc Company in a more or less random pattern into the seven zones which comprise the residue bank. If there was any bias in selecting the locations to be investigated, it was that the drilling areas were chosen where the expectation of high metallic values was greatest. Approximately 200 samples were taken and analyzed.

The results of the drilling program, which analyzed for specific metals, are summarized below and as a whole, the bank can be said to contain the following:

27,500,000 Tons of Residue
16% Carbon
2.7% Zinc
0.025% Cadmium
0.36% Lead
0.33% Copper
0.6 Oz./T Indium

The Cinder Bank has been the repository of process residues and other wastes from the Palmerton operations for the past 65 years. It is located behind the East Plant and stretches approximately two and one-half miles along the base of Blue Mountain, covering about 200 acres of the lower slope. Until 1970, all of Palmerton's municipal waste was disposed by burying it in the residue. As of December 1987 the Cinder Bank ceased to be used as a depository for plant waste material.

An estimated 25-30 million tons of various materials are deposited over this area in irregular piles and ridges. Some segregation by type has been practiced in recent years with the objective of potential reclamation. During the past 30 years, considerable quantities of material suitable for aggregate and anti-skid uses have been removed by private contractors.

The method of transporting, unloading and distributing the waste materials has changed over the life of the Cinder Bank, and, to some extent, it has determined the character of the bank. Prior to the late 1940's, the materials were transported in gondola cars by steam locomotives and unloaded by locomotive cranes, followed by gangs of laborers who shoveled out the remaining material. The material was piled in ridges on either side of the unloading track, causing long shallow ridges. With the conversion in the 1940's to diesel locomotives, dump-type rail cars, bulldozers, and front-end loaders, steeper track grades became possible and large, broad, deep piles resulted which buried many of the early ridges.

The Cinder Bank area has been geographically zoned with regard to material types and environmental factors (see Figure 3). In general, Zones A, B and C at the east end are the significant sources of environmental concern because leachate contaminated with heavy metals can enter the nearby Aquashicola Creek. These zones are influenced the most by the residues generated since 1950 when a substantial increase in the use of sulfur-bearing ores occurred. The other zones, thus far, have indicated minimal problems with contaminated leachate.

Zone A - 3,000,000 Tons (Estimate)

This zone comprises a single large pile of Vertical Retort residue, American Process Oxide residues, and municipal waste, capped by a layer of blast furnace slag deposited during the 1950's. Some burning has occurred within this pile and the leachate is contaminated with heavy metals. It has been graded over a bed of high lime residue from the Waelz Kiln process to precipitate the heavy metals, and was vegetated with zinc tolerant grass in an attempt by the site owners to further her reduce the reduce the contaminated leachate problem.

Zone B - 5,000,000 Tons (Estimate)

This zone is at the extreme end of the bank and contains most of the Vertical Retort and American Process Oxide residues generated during the 1960's and 1970's. Municipal waste was buried in an isolated section of the zone, and the balance of the material placed during this period is relatively undiluted. There is a small section where Vertical Retort residue from processing high silver and indium-bearing Huari concentrates are segregated. A portion of one of the ridges contains around 2% copper believed to be part of the residue from processing African concentrates during the mid-1940's.

Zone C

This zone was designated primarily as a part of the environmental program because it is a swampy area draining the leachate from Zone B. A small quantity of the highly alkaline Waelz Kiln residue has been placed along the edge of this zone as a start in efforts to precipitate heavy metals from the leachate.

Zone D - 15,000,000 Tons (Estimate)

This zone is a large, irregular ridge about two-thirds mile long, containing a mixture of all types of waste-furnaces residues, coal ashes, sludges, slags, and municipal waste. It was last used in the 1940's. Most of the aggregate reclamation activity has taken place here, leaving pits, exposed faces of fused material and piles of screening rejects. Considerable internal burning has taken place and hot spots are still in evidence today.

Zone E - 500,000 Tons (Estimate)

This zone was designated for Vertical Retort residue exceeding 5% zinc. Since the shutdown of the metal circuit in November 1980, American Process Oxide residue has been deposited at this location. No evidence of burning appears at this zone.

Zone F - 500,000 Tons (Estimate)

Approximately half of this zone contains American Process Oxide residue with zinc content around 10%, making this material a suitable feed to the Waelz Kilns when mixed with other higher zinc material. A small ridge of residue trailing off to the east contains 4-7% copper in an estimated 3,000 tons of residue. Like the area in Zone B, this residue is also believed to have resulted from processing African concentrates.

Zone G - 500,000 Tons (Estimate)

This zone has a variety of materials not readily identified. However, one identified material is Vertical Retort residues from processing Willemite ore.

Zone H - 3,000,000 Tons (Estimate)

This zone contains mostly Waelz Kiln residues in the west portion with a lesser quantity of high iron and manganese residues from the former flat grate oxide furnaces. Several thousand tons of waste acid treatment sludge and about a thousand tons of Cadmium Plant residues are located atop the Waelz Kiln residues bordering the mountainside.

B. Cinder Bank Runoff and Seepage

Much of the Cinder Bank residue is in the form of briquettes from the vertical retorts and contains residual metals and carbonaceous material. As a result of either incomplete quenching or spontaneous combustion large portions smolder continuously and several of these areas are posted as "Fire Areas". In areas that have not been physically disturbed, large cracks form in the surface roughly parallel to the outer edge. Occasionally large blocks of partially consolidated residue come off of the main mass of the Cinder Bank and tumble down the steep north slope toward Aquashicola Creek. As the cracks develop, steam and smoke issue from them leaving sublimated sulfurous deposits on the adjacent surfaces. These cracks and resulting broken rough surfaces provide avenues for rapid infiltration and percolation of rain and snow melt and facilitate leaching of soluble constituents from the Cinder Bank. In addition, the Cinder Bank has been contoured to a slope approaching 2 to 1 which is unstable.

Evidence of mineral leachate from the Cinder Bank is abundant. Zinc concentrations in waters passing over or through the Cinder Bank increased significantly, especially in the area east of NEIC Station 69 (NJ2 Station 10A) (see Figure 4). In this area, zinc concentrations increased from background levels ranging from 0.27 to 0.67 mg/l to values generally greater than 17 mg/l and as high as 230 mg/l in Cinder Bank run-off and seepage. Increase cadmium concentrations in the Cinder Bank run-off were also highest in this area.

The high concentrations of zinc in run-off and seepage from the east end of the Cinder Bank contributes to significant increases of zinc in Aquashicola Creek. About one-half of the total zinc load to the creek entered upstream of the Field Station Bridge (see Figure 2).

Cadmium and zinc were detected in all samples from seeps and springs near the base of the Cinder Bank. The average concentration of dissolved cadmium in samples from the seeps and springs at the base of the Cinder Bank was 0.118 mg/l or about 10 times higher than the run-off not influenced by the Cinder Bank. The average of all dissolved zinc concentrations in samples of seeps and springs at the base of the Cinder Bank was 35 mg/l or about 24 times greater than background.

The highest concentrations of cadmium and zinc observed were in samples from seeps and springs along the eastern 0.6 mile at the base of the Cinder Bank. These samples also exhibited low pH values from 4.3 to about 6 standard units.

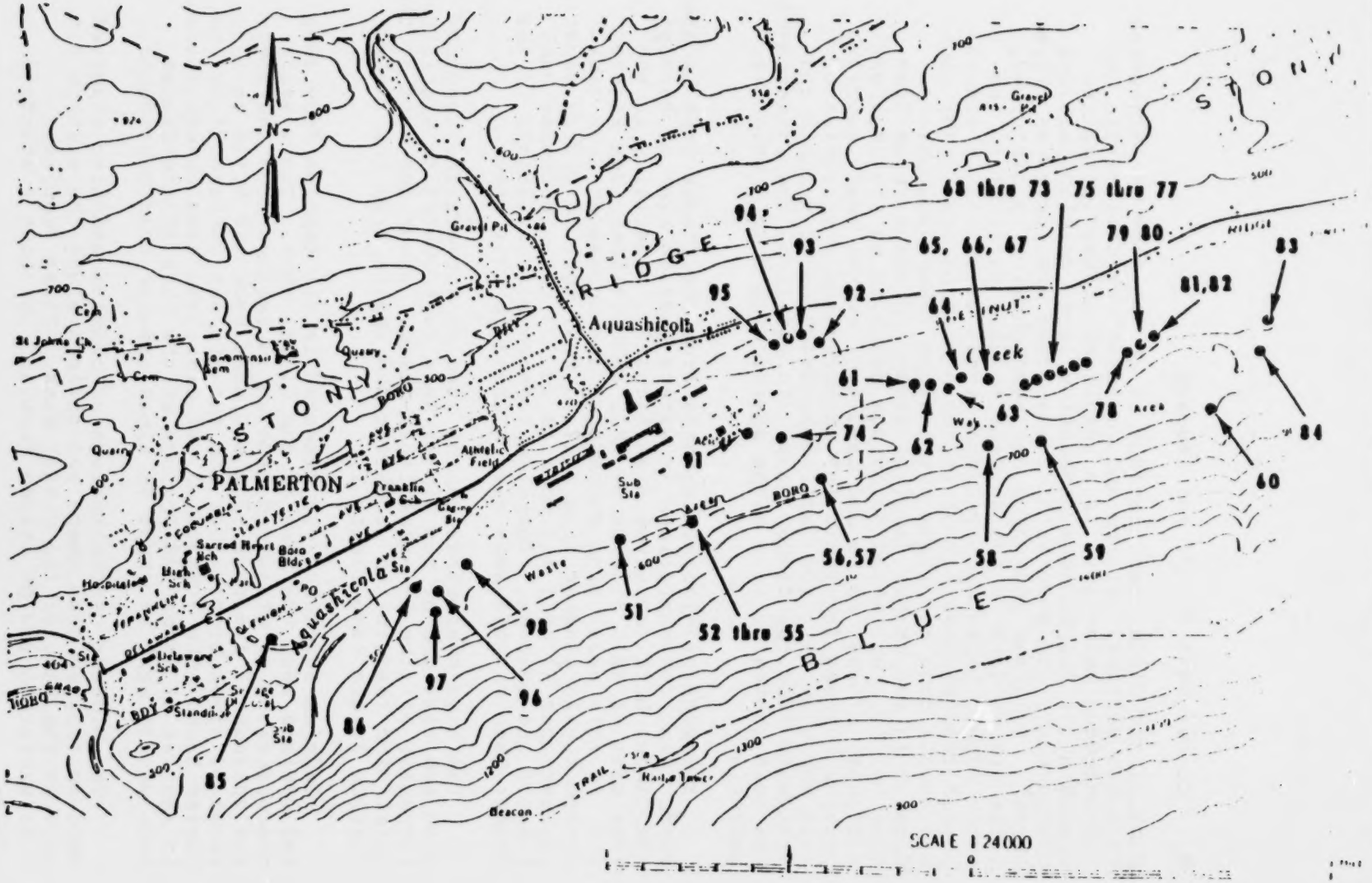


FIGURE 4

Figure 2. Blue Mountain Runoff, Cinder Bank Runoff and Seepage and Groundwater (Well) Sampling Locations

Data from samples of seeps and springs at the base of the Cinder Bank show clearly that cadmium and zinc are being leached from the Cinder Bank and contribute to the contamination of Aquashicola Creek and the area groundwater.

Average annual precipitation in the vicinity of Palmerton is about 46 in. (117 cm) of which about 49% falls during the growing season (May to September); average annual runoff is about 24 in. (61 cm). The drainage area directly above Aquashicola Creek to the crest of Blue Mountain in the reach spanned by the NJZ East Plant and the Cinder Bank is about 1,100 acres (4.5 x 10 sq m). Therefore, the average annual run-off to Aquashicola Creek from the Cinder Bank and Blue Mountain is about 2,200 acre-ft. Assuming that run-off and seepage flows and metals concentrations during the surveys were representative of average conditions, the average annual loads of cadmium and zinc contributed to Aquashicola Creek in the reach between the east end of the Cinder Bank and the 6th Street Bridge would be estimated at about 0.48 tons/yr and 110 tons/yr, respectively.

During periods of run-off, contaminated storm water percolates through the Cinder Bank to the groundwater. The groundwater recharges the creek and also seeps out through the Cinder Bank. The Company has attempted to isolate Blue Mountain runoff from the Cinder Bank with little success. Pipes were placed at the surface discharges of two rills to convey this water over the Cinder Bank. The pipes on top of the Cinder Bank froze, split and were not repaired. As a result, the water flows into the Cinder Bank.

2. Surface Water

There are significant contributions of zinc, cadmium and manganese to Aquashicola Creek in the reach from Harris Bridge to the 6th Street Bridge, located just downstream from the East Plant. Zinc and cadmium loads each increased about thirty times in this reach, while manganese increased sevenfold. No increases in metals above that which was found in the reach of the Aquashicola Creek from the Harris Bridge to the 6th Street Bridge were noted between the 6th Street Bridge and the Tatra Inn Bridge at the confluence of Aquashicola Creek and the Lehigh River.

Based on five-day average data, most of the zinc and cadmium load was contributed to Aquashicola Creek by groundwater and run-off sources:

Source	Zinc	Cadmium
Non-point contribution between Harris and Field Station Bridges (%)	50	13
Non-point contribution between Field Station and 6th Street Bridges (%)	32	79
Total of non-point contribution between Harris and 6th St. Bridges (%)	82	92
East Plant Discharges (%)	18	8
Total (%)	100	100

Most of the zinc enters the creek upstream of the Field Station Bridge. However, most of the cadmium enters the creek between the Field Station and 6th Street Bridges in the reach directly adjacent to the plant.

Cross-sectional concentration data at three stations in the Harris Bridge to 6th Street Bridge reach showed generally higher zinc and cadmium levels on the Cinder Bank side of the creek. No significant metal concentrations were found in Mill Creek, indicating that the run-off and groundwater from the drainage area on the left side of Aquashicola Creek are relatively metal-free.

Particulate erosion from the Cinder Bank adds to the contamination of Aquashicola Creek. Sediment analyses for cadmium, zinc, manganese, lead, and copper from Aquashicola Creek stations adjacent to the Cinder Bank showed increases above nearby background stations of 32, 26, 17, 11, and 10 times, respectively.

Metals released to Aquashicola Creek in the reach adjacent to the Cinder Bank had a negative impact on water quality, resulting in imbalanced aquatic communities. Benthic macroinvertebrate and periphyton numbers and diversity were reduced, as was the survival of test fish.

3. Sediment Quality

Zinc concentrations in sediments from the background Stations (27, 99 and 30) ranged from 420 mg/g to 840 mg/g and averaged 620 mg/g. The stations (25, 24, 23, 22, 21, and 20) adjacent to the Cinder Bank, East Plant and downstream on Aquashicola Creek to its confluence with the Lehigh River ranged from 6,200 mg/g to 42,000 mg/g and averaged 19,900 mg/g. This is 32 times the average of the background stations.

Cadmium concentrations in sediments from the background stations ranged from 2 to 13 mg/l and averaged 6 mg/l. The Stations (25, 24, 23, 22, 21, and 20) adjacent to the Cinder Bank, East Plant and downstream on Aquashicola Creek to its confluence with the Lehigh River ranged from 39 mg/l to 420 mg/l and averaged 157 mg/g. This is 26 times the average of the background stations.

Similarly, manganese, lead, and copper, as compared to the background stations, showed corresponding increases adjacent to the Cinder Bank and East Plant areas of 17%, 11% and 10%, respectively.

Background concentrations of zinc in stream sediments in southeastern Pennsylvania are generally less than 200 parts per million (ppm). The high concentrations of metals in Aquashicola Creek and in the Lehigh River sediment are attributed to discharges including erosion from the Cinder Bank.

A. Benthic Macroinvertebrates

Both Aquashicola Creek and the Lehigh River are characterized by a well-entrenched channel, moderate gradient and frequent large cobble-filled riffles over a hard-rock bottom. Thoughout the study area, including reference (control) sites, benthic macroinvertebrate population levels were low (44 to 1851/m^2) indicating that both Aquashicola Creek and the Lehigh River are not highly productive.

In Aquashicola Creek at Station 27, the reference station, the benthos reflected good water quality. The 29 kinds of organisms collected were well distributed among the forms present. Conditions began to deteriorate at the next two downstream sites, stations 32 and 25, where a 40% reduction in the number of kinds and 45% reduction in numbers/m^2 occurred. This reach of the stream is influenced by run-off from the NJZ Cinder Bank and changes in the benthos population are attributed to the high heavy metal concentrations in the run-off.

Conditions found in the Lehigh River, both upstream and downstream of Aquashicola Creek, reflect typical conditions for large, organically enriched, eastern U.S. rivers. No apparent effect of Aquashicola Creek on the river was observed.

B. Periphyton

Periphyton communities reflected the influence of the Palmerton Zinc Site in several ways. Attached algal populations responded to the toxicity of Cinder Bank run-off and seepage by decreasing from about 40,000 organisms per cm^2 at reference Station 27 to about 20,000 and 5,000/cm^2 in the reach adjacent to the Cinder Bank. This toxicity-induced decrease was also reflected in low chlorophyll concentrations of 69 and 27 ug/cm^2.

It appears that wastes carried by Aquashicola Creek did not influence Lehigh River periphyton significantly; communities were similar in numbers and composition upstream and downstream from the creek confluence.

C. Fish Survival

Mortalities among in-situ test fish occurred at six of eleven exposure sites. Significant mortality (greater than the 10% allowable for the control group) only occurred at Stations 20, 21, 22, and 23; this is the reach of Aquashicola Creek extending from the mouth to approximately 3 river kilometers upstream. This stretch of the creek receives Cinder Bank run-off and seepage.

There appears to be a correlation between total zinc concentration and mortality. At Station 24, the average total zinc concentration during the exposure period was 0.49 mg/l and no mortality of test fish was recorded. Station 21 had an average total zinc concentration of 0.87mg/l, and produced the highest mortality of any site (40%). At Station 20, near the confluence of Aquashicola Creek, total zinc concentration was somewhat lower at 0.71 mg/l and 20% mortality occurred.

3. Groundwater Quality

Specific conductivity of groundwater samples from seven wells on the East Plant site ranged from 130 to 800 micromhos per centimeter. Calculated total dissolved solids concentrations ranged from 85 mg/l to 520 mg/l. Generally, waters of this quality are considered acceptable for public drinking water supply. However, zinc concentrations in groundwater ranged from 0.003 mg/l to 3.2 mg/l and cadmium concentrations ranged from 0.002 mg/l to 0.024 mg/l. Zinc was detected in all seven wells sampled and cadmium was detected in four of the seven wells sampled. Higher levels of zinc and cadmium were detected in the two wells designated as Stations 93 and 94. These wells are located on the east side of the field Station between the Cinder Bank and raw materials storage area on the south and Aquashicola Creek on the north. Because of its location and the presumed direction of natural groundwater flow from south (Blue Mountain) to north (Aquashicola Creek), it is likely that the high metals concentrations in the wells resulted from leachate originating in the Cinder Bank. Pumping of the wells in this well field induces groundwater flow toward the well field from the Creek. The dilution of the groundwater provided by this infiltration results in metals concentrations somewhat lower than would be expected in the shallow aquifer if no pumping and induced infiltration were occurring.

Station Nos. 96, 97 and 98 are wells at the west end of the East Plant area on the lower flank of Blue Mountain near the Palmer Water Company maintenance building and a railroad switching yard. These wells are referred to by the Palmer Water Company as "deep wells," ranging in depth from about 200 ft (60 m) to more than 400 ft (120 m). The aquifers tapped by these wells are bedrock aquifers of small yield and have little or no direct contact with surface waters or the shallow alluvial aquifer. A small amount of cadmium was detected in Station No. 98 and low concentrations of zinc were detected in each of these three wells.

C. SUMMARY OF SITE RISKS

As required by the Superfund Amendments and Reauthorization Act (SARA) of 1986, EPA asked the U.S. Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate the health threat posed by the defoliated portions of Blue Mountain. In a February 6, 1987 memorandum, ATSDR found that there is potential risk in human exposure through consumption of fish.

Erosion and run-off from the Cinder Bank have contributed to high metal levels in fish. The levels of lead and cadmium in the fish present a potentially significant health threat to persons who regularly consume fish from area streams. It is ATSDR's opinion that ". . . consumption of fish from the area streams presents a potential health threat and . . . the public should be advised to consume fish from the immediate area streams on a limited basis only (no more than once per week)."

Rainwater infiltration and surface water infiltration (Blue Mountain runoff) are leaching metals from the Cinder Bank and contributing to contamination of Aquashicola Creek. Low pH values assist in the leaching of metals from certain sections of the Cinder Bank.

The easternmost portion of the Cinder Bank appears to have the greatest impact on water quality with the zinc concentrations averaging 40 to 80 times greater than background zinc concentrations and cadmium concentratins averaging 10 times greater than background cadmium concentrations.

If average metal concentrations obtained from ZCA'S two-sampling events in 1986 are assumed for the entire Cinder Bank, then these values, along with run-off and drainage area calculations from NEIC's 1979 investigation, indicate that the Cinder Bank may contribute 283 lbs. of cadmium, 622 lbs. of copper, 90 lbs. of lead, 296 lbs. of manganese, and 117,051 lbs. of zinc to Aquashicola Creek each year.

Non-point sources, such as groundwater discharge, are responsible for between 80 and 95 percent of metals loading to Aquashicola Creek.

VI. Community Relations History

The community has generally been concerned about the environmental devastation and the negative image a barren mountain projects. The action being considered at this time deals only with the Cinder Bank, however, there are two other major contamination problems which are of public concern: 1) widespread soil contamination which exists because of the deposition of heavy metals from past air emissions from the smelter, and 2) significant groundwater and surface water contamination on and near the smelter property.

The public has been concerned about the potential health effects of the soil and groundwater contamination and also about the potential financial impact on the Zinc Corporation of America of any remedial action. An RI/FS on the widespread soil contamination is being completed by the previous owners of the smelter, Gulf & Western, Inc. pursuant to a consent order with EPA. The report will be available for public review and comment in the coming months. A separate RI/FS for the overall surface water and groundwater is also underway.

VII. Remedial Alternative Objectives

The major objectives of remedial actions to be taken at the Palmerton Zinc Superfund Site include (1) minimize direct contact with the Cinder Bank (2) reduce volume of run-off, (3) reduce contamination in run-off, (4) reduce the volume of run-on, (5) collect and treat leachate, (6) reduce wind-borne contaminated emissions and (7) reduce particulate erosion.

Based on the above objectives, numerous source control and mitigation control technologies were screened to provide a limited number of technologies applicable for remedial actions at the Site. Some of these technologies were removed from further consideration based on site specific information and other comparative criteria listed in Table 1.

VIII. Description of the Alternatives

A. Remedial Alternative Evaluation

Each technology was evaluated not only in terms of theoretical feasibility, but also in terms of whether the technology is applicable to the site specific conditions. The candidate technologies that were dismissed from retention are presented below with a summary of the justification for elimination.

Technology	Reason(s) for Elimination
- Site Fencing	High cost and does not minimize risk
- In-situ chemical precipitation	Poor performance and unreliable
- Removing substances for offsite disposal/ treatment	High cost; negative environmental and public health impacts during construction; unavailability of adequate treatment/disposal services
- Construction of Hazardous Waste Landfill onsite	Site is located in a floodplain; High cost to construct and operate.
- Recycling Material in Cinder Bank	High cost; negative environmental and public health impact.

The technologies that have been retained for further analysis can be grouped into the following four alternatives:

- No-action
- Capping using soil amendments and vegetation
- Collection and treatment of run-off and run-on
- Capping using soil-clay mixture and vegatation

To analyze these alternatives, an evaluation was conducted that considered the new requirements of the Superfund Amendments and Reauthorization Act of 1986 (SARA)(P.L. 99-499) and the current version of the National Contingency Plan (NCP) (50 Fed. Reg. 47912, November 20, 1985). Three broad categories were used for the evaluation: effectiveness, implementability, and cost. Within these categories there are seven factors that consider the short-term and long-term effects of each alternative (see Table 1). The evaluation is presented in detail in the RI/FS report on the Cinder Bank. The following is a summary of the evaluation:

TABLE 1

EVALUATION FACTORS FOR ALTERNATIVE EVALUATION

	EFFECTIVENESS		IMPLEMENTABILITY			COST	
	Protectiveness	*Reduction of Toxicity, Mobility, or Volume*	*Technical Feasibility*	*Administrative Feasibility*	*Availability*	*Remedy*	*Replacement*
SHORT-TERM	Reduction of existing risks Compliance with ARARs Compliance with other criteria, advisories, and guidances Protection of community during remedial actions Time until protection is achieved		Ability to construct technology Short-term reliability of technology	Ability to obtain approvals from other agencies Likelihood of favorable community response Coordination with other agencies Development of future coordination network Compliance with some location-specific ARARs	Availability of treatment, storage, and disposal services and capacity Availability of necessary equipment and specialists	Development and construction costs Operating costs for implementing remedial action Other capital and short-term costs until remedial action is complete	
LONG-TERM	Reduction of future risks Long-term reliability Compliance with ARARs Prevention of future exposure to residuals Potential need for replacement	Permanent and significant reduction of toxicity, mobility or volume Use of permanent solutions and treatment technologies or resource recovery technologies	Ease of undertaking additional remedial action, if necessary Ability to monitor effectiveness of remedy Ability to perform operation and maintenance functions			Costs of operation and maintenance for as long as necessary Costs of 5-year reviews	Potential for remedial action or replacement costs if remedy were to fail

Alternative 1. - No-Action

The NCP requires that the no-action alternative be considered. This alternative will have no environmental or public health benefits. It will not be protective in the short-term or the long-term. The metals on the Cinder Bank will not degrade and will remain mobile and toxic for decades and probably centuries. The environmental and public health problems will continue into the foreseeable future.

Taking no action would not comply with the requirements of the Clean Water Act regarding Best Management Practices (BMP). As discussed in a 1979 EPA report by the National Enforcement Investigation Center (NEIC), steps should be taken to minimize erosion and run-off from the Cinder Bank in order to comply with the BMP requirements of the Clean Water Act.

The factors in these categories do not require an implementability and cost analysis since there are no imple-implementation issues or costs associated with taking no action.

Alternative 2 - Capping using Soil Amendments and Vegetation

This alternative would consist of using a mixture of wastewater treatment sludge, lime potash, and fly ash to aid in establishing a vegetative cap covering the Cinder Bank. This method is considered an innovative technology and is also solving the sludge and flyash disposal difficulties encountered by local municipalities and industries. This alternative only addresses that portion of the Cinder Bank which EPA and PADER determine to be subject to municipal waste regulations. Pennsylvania State ARARs require a minimum 2 foot soil cover over municipal waste.

Studies conducted by the City of Allentown and the Zinc Co., between 1979-1983, demonstrated the feasibility of using sludge to vegetate the bank, i.e., the vegetation in these areas, some of which is entering its tenth year with no maintenance, is still performing very well. As discussed in chapters 5 and 6 of the Remedial Investigation for the Blue Mountain project, greenhouse studies and field tests have demonstrated that this technology is feasible. The exact design and procedures will be based on further analysis of the field plots. This alternative will be effective by being protective in both the short-term and long-term and will reduce the toxicity and mobility of the hazardous substance onsite.

The alternative will meet all seven of the remedial action objectives. The direct contact risk will be reduced in the short-term through the application of the soil amendments. In the long term, after vegetation is established, the direct contact threat will be further minimized as a layer of organic debris is formed from falling leaves and a mat of stubble and grass debris is formed. Vegetation can significantly reduce the volume of run-off by plant uptake or transpiration of water in their growth processes. Through transpiration large amounts of water can be pumped back out of the soil. It is anticipated that the vegetation program will help reduce the metals levels in the run-off in a number of ways as detailed in the Cinder Bank FS. In general, it has been established that wind erosion can be abated by having a 40% cover of vegetation. Work already completed on the Cinder Bank shows that stands of vegetation ranging from 90-100% are possible if the correct amendments and techniques are employed.

This alternative meets the Clean Water Act requirements of BMP because vegetating the Cinder Bank will reduce surface water discharges and prevent particulate erosion. The vegetation program will reduce the mobility of the metals. The lime will help form low-solubility metal compounds and the organic matter in the vegetative debris will form organic complexes to further reduce the mobility of the metals. The volume of hazardous substances will not be reduced because no cinders or organic matter will be removed from the Site.

The short-term technical and administrative feasibility is very good. The materials and equipment required to implement the project are available, or, in the case of a spreader truck, could be built in 60 to 100 days. To date, support from the local community and the state government has been very favorable and helpful. Continued support is anticipated and would be necessary for the successful implementation of the project.

Relevant and appropriate action and location-specific requirements regarding the land application of sewage sludge have been developed by the Commonwealth of Pennsylvania. Commonwealth

guidelines require that soil pH be adjusted to 6.0 in the first year, up to pH 6.5 by the second year and maintained at 6.5 for 2 years following application. With joint applications of lime and fly ash, these levels should be attainable. A protective erosion and sedimentation plan will be developed and implemented.

It may be technically impossible to meet some of the guidelines (i.e. sludge application and 2 foot municipal landfill soil cover) because of the terrain on the Cinder Bank. Specifically, the steep terrain prevents incorporation of the sludge/fly ash into some areas of the cinders as preferred by the guidelines; the slopes of the Cinder Bank are in excess of the 20% maximum recommended by the guidelines. To overcome these problems, the project can be implemented to minimize any erosion caused by the steep slopes and the inability to incorporate the sludge. Consideration of Wetland and Floodplain Regulations will be incorporated into the final plans when making decisions on slope contours.

Overland movement of the sludge/fly ash mixture was nonexistent during the field tests. The long term effectiveness of the alternative can be monitored through soil and water sampling. Vegetative growth and metals uptake by the plants can also be easily monitored.

Operation and maintenance will be necessary to control erosion of the soil amendments and insure the integrity of the vegetative cover. Because the pH of the rainfall in Palmerton is acidic, it is anticipated that over several years the Site could begin to reacidify. This can be easily monitored through routine soil testing and top-dressings of lime can be applied as needed.

All remedial action on surface water and groundwater beyond controlling Cinderbank Run-on and run-off will be handled under Palmerton Zinc Operable Unit 4.

The costs to implement this alternative are calculated to be approximately $4,500,000 which includes some slope contouring and placement of 2 foot soil cover on 25% of the Cinderbank (this percentage is for costing purposes only).

Alternative 3 - Collection and Treatment of Runoff and Run-on

This alternative would consist of using a combination of lime activated filtration lagoons and/or constructed wetlands as a treatment for the collected run-off. These systems should precipitate or bioaccumulate any metals that remain in the run-off. Laboratory tests and field studies have demonstrated that both of these technologies are technically feasible. The exact design and procedures will be based on further laboratory and field tests.

This alternative will be effective in both the short-term and the long-term for the lime filtration lagoons, and in the long-term for the constructed wetlands, following the establishment of the vegetation. This alternative will reduce the toxicity and mobility of the the hazardous substances on site.

This alternative meets all seven of the remedial action objectives. In addition, it meets the Clean Water Act requirements of BMP to reduce surface water discharges.

The vegetation in the wetlands will reduce the toxicity, mobility and volume of metals in the run-off by bioaccumulation. As the vegetation in the wetlands becomes saturated with metals, it can be harvested and run through the kiln.

The lime in the filtration lagoons will reduce the toxicity, mobility and volume of metals in the water being treated by chemical precipitation of the metals. As the lime becomes saturated with metals, it can be replaced with fresh lime, and the old material can be run through the kiln and regenerated. The short-term technical and administrative feasibility is very good. It is technically feasible to install constructed wetlands and lime-activated filtration lagoons. The materials and equipment needed are available or could be purchased. The cost of this alternative is approximately $2,861,800.

The long-term effectiveness of this alternative can be monitored through water, plant, and soil sampling. Operation and maintenance should be limited to harvest of the above-ground portions of the wetland plants on an infrequent basis and replenishment of the lime in the filtration lagoons as needed. Some routine maintenance such as keeping water dispersion structures operational will be needed periodically.

The goal of this alternative is to treat Cinder Bank leachate and potentially treat Blue Mountain run-off and reduce metal levels to surface water background comparable to areas not impacted by the Palmerton Zinc Site.

Alternative 4- Capping Using Soil and Vegetation

This alternative would consist of contouring the Cinder Bank and applying a cap on the Cinder Bank. This cap would prevent water from infiltrating the cinders and will consist of an initial placement of 6 inches of soil and bentonite mixture covered by 18" of soil. Over the cap, there will be a cover of soil into which there may be incorporated wastewater treatment sludge, lime potash, and fly-ash, or some combination of these materials, to aid in establishing a vegetative cover of shortrooted grasses for erosion control.

The alternative will meet remedial action objectives. The toxicity and mobility of the hazardous substances will be reduced, although, because no cinders will actually be removed from the Cinder Bank, the volume of hazardous substances at the site will not be reduced.

The remedy is protective of human health and the environment, as it will eliminate access to the hazardous substances by direct contact, prevent water and wind from moving the hazardous substances, and, ultimately, will reduce metal-contaminated water from entering either groundwater or surface water.

Finally, the remedy satisfies the statutory preferences for maximum use of alternative technology and for permanence. While the remedy is innovative and practical, it is not experimental, but rather comes from a proven method for dealing with large piles of waste materials. The method's dependability also insures that it will permanently work to eliminate access to the hazardous substances by water, wind, animals, and humans. The cost of this alternative, assuming contouring 25% of the Cinder Bank to a 30% grade, then placing the cap on 50% of the Cinder Bank, is approximately $5,500,000 (listed percentage for slope contour and cap placement are for costing purposes only). Operation and maintenance costs and technical considerations

will be reduced to periodic walkthrough, once erosion from the Cinder Bank has ceased, to insure that no damage has been inflicted as that cinders might become exposed. Capping may eliminate the need for a leachate collection system and erosion-controlling grasses eliminate the need, when the remedy is complete, for catching and settling the clean water from the Cinder Bank. The diverted water from Blue Mountain, also clean run-off, will be able to enter the Aquashicola Creek directly. The need for these water and leachate management systems will be reevaluated once the Cinder Bank has been revegetated.

The remedy meets the requirements of the Clean Water Act Best Management Practice and the Pennsylvania Solid Waste Management Act ARARs, as it significantly reduces contamination in surface water discharges and in groundwater. Although residual contamination will be present as water remaining in the Cinder Bank and in the ground makes its way to the Aquashicola, this remedy will stop the crescendo of contamination.

IX. DESCRIPTION OF MAJOR ARARS

FEDERAL

CWA	- Wetlands impact
	- Differential Groundwater Policy
	- Best Management Practices
	- Ambient Water Quality Criteria
RCRA	- Land Ban Disposal Restrictions
Executive Order 11988, Protection of Floodplains 40 CFR 6, Appendix A	- Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial value
Executive Order 11990, Protection of Wetlands, 40 CFR 6, Appendix A	- Action to minimize destruction, loss, or degradation of wetlands

STATE

PADER -Guidelines for Sewage Sludge Land Reclamation (April 1988)	- Maximum metals loading rates

Solid Waste Management Rules and Regulations -		
Section 275:"Standards for Land Application of Sewage Sludge Waste Disposal".	-	Application and storage of optional sludge
Section 273: Standards for Municipal Waste Landfills	-	Cover and vegetation

X. Comparative Analysis

No environmental or public health benefits would result from implementing Alternative 1. The reduction of existing or future health risks by preventing continued exposure to metals would not be addressed. Unlike Alternative 2, 3, and 4 the metals would remain mobile and would continue to contaminate area surface waters and groundwater by not minimizing run-off, erosion and infiltration. This would not comply with requirements of the Clean Water Act regarding Best Management Practices (BMP).

Alternative 1 does not require an implementability analysis since there is no implementation issues associated with taking no action. Based on the results of field test plots, Alternative 2 is implementable, provided there are reliable sources of sewage sludge to complete the revegetation of the defoliated area. Alternative 3 is implementable but depends on achievable contours, Alternative 4 will be implementable.

There are no costs for Alternative 1 since this involves no action. Implementing Alternative 2 and 3 would be cost effective, if the cost of supplying the wastewater treatment sludge for municipalities is a cost effective means of disposal in lieu of their current practices. Alternative 4 is the preferred alternative by the Commonwealth of Pennsylvania and will be implemented where slope contours allow, and where not, Alternative 3 will be utilized. Alternative 4 is cost effective in the long term by reducing the amount of leachate to be treated.

XI. Documentation of Significant Changes

No significant changes to the preferred alternative presented in the proposed plan have occurred with the exception of being more specific in addressing the required ARAR base covers prior to the placement of the sludge-flyash mixture and vegetation.

XII. Selected Remedial Alternative

A. Description and Performance Goals

Section 121 of SARA and the current version of the National Contingency Plan (NCP)(50 Fed. Reg. 47912, November 20, 1985) establish a variety of requirements pertaining to remedial actions under CERCLA. Applying the current evaluation criteria in Table 1 to the four remaining remedial Alternatives, we recommend that Alternative 3 be implemented. In addition, on areas of the Cinder Bank which contain RCRA listed waste Alternative 4 is recommended, otherwise, in the areas not containing RCRA listed waste, Alternative 2 will be implemented. Prior to implementation of any remediation alternatives, both EPA and PADER will be in complete agreement with the remedial design for the remedies.

This is an interim remedy for the site. When the RI/FS for the other Operable Units are completed by the responsible parties, RODs will be issued to address all aspects of the site. This interim remedy will not, however, be inconsistent with a final comprehensive remedy for the Site. This interim remedy attempts to ensure compliance with all ARARs for this Operable Unit and will be consistent, to the extent practicable, with those ARARS addressed herein.

The general procedures for the above described remediation will be as follows:

Step 1: Contour Slopes of Cinder Bank

Slope modification is required to enhance precipitation run-off from the Cinder Bank and reduce the amount of precipitation infiltration and particulate erosion. Heavy equipment will be used to modify slopes targeted for vegetation. Excessively steep or otherwise unstable slopes may be built-up from the toe of the slope. Gas vents will be installed, if necessary. The Remedial Design generated prior to the implementation of this interim remedial action will provide grading specifications necessary to ensure success in the final cap placement.

Step 2: Construction of Surface Water Diversion Channels

Surface water diversion channels will be constructed, which will assure the water run-off from Blue Mountain will be diverted away from the Cinder Bank area. During construction of the remediation action, surface water run-off from Blue Mountain will be diverted through channels away from the Cinder Bank and to a treatment system if warranted. Leachate from the Cinder Bank will be collected by channels and diverted to the treatment system. Initially, lagoons in compliance with RCRA standards, will be utilized for the temporary storage of collected surface water.

Step 3: Construction and Cap

A cap consisting of a minimum of 18" of soils and 6" of clay or soil/bentonite mixture will be placed over the Cinder Bank
to prevent: 1) leaching of heavy metals into the groundwater; and 2) seeps contaminated with heavy metals from exiting the toe of the Cinder Bank. (See Alternative selection for further discussion.)

Step 4: Vegetative Cover

A stabilizing vegetative cover will be applied over the cap. The cover may be comprised of a wastewater treatment sludge/flyash mixture, or conventional mulching, fertilization and seeding. The purpose of the vegetative cover will be to stabilize the slopes, prevent erosion, and control surface water movement.

Step 5: Long-Term Activities

An inspection, monitoring, and maintenance plan to assure effectiveness of the remedy will be implemented.

B. Statement of Findings Regarding Wetlands and Floodplain Management

The Palmerton Zinc Site is located within a floodplain and contains several wetland areas. All excavation and fill activities during the remedial action shall be conducted in a manner consistent with provisions of Appendix A of 40 CFR Part 6. The subject regulations have been entitled "Statement of Procedures on Floodplain Management and Wetland Protection." These procedures constitute policy and guidance for carrying out provisions of Executive Orders 11990 and 11988 respectively.

The Remedial Design of the Remedial Action shall be developed in a manner consistent with Appendix A of 40 CFR Part 6 to assure that potential harm and adverse effects to the wetlands is minimized. The Remedial Design has not yet been initiated at this time. Therefore, specific steps to minimize impacts have not yet been identified. In addition, the effect of the Remedial Action on the wetlands cannot accurately be assessed at this time.

While all remedial measures shall be designed to minimize harm to wetlands, it is possible that some adverse effects may be unavoidable. Should remedial activity be expected to create such effects, restorative measures shall be developed during the Remedial Design. Should anticipate adverse effects occur, restorative measures shall be implemented as part of the Remedial Action.

Schedule

The anticipated schedule is to continue with some limited design studies in the Fall of 1988. Beginning as soon as possible, but probably not before the end of 1988, large scale, multiacre revegetation will begin. It will take a number of years to complete the remedial action, the exact time depending on the amount of sludge available. EPA's goal is to complete the project in three years.

XIII. The Statutory Determinations

A. Protection of Human Health and The Environment

The selected remedy will reduce and control the amount of Cinder Bank leachate which will ensure adequate protection of human health and the environment. No unacceptable short-term risks or cross-media impact will be caused by implementation of the remedy.

B. Attainment of ARARs

The selected remedy will attain the applicable or relevant and appropriate requirements and are as follows:

FEDERAL

CWA	- Wetlands impact
	- Differential Groundwater Policy
	- Best Management Practices
	- Ambient Water Quality Criteria
RCRA	- Land Ban disposal Restrictions
Executive Order 11988, Protection of Floodplains 40 CFR 6, Appendix A	- Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial value
Executive Order 11990, Protection of Wetlands, 40 CFR 6, Appendix A	- Action to minimize destruction, loss, or degradation of wetlands

STATE

PADER -Guidelines for Sewage Sludge Land Reclamation (April 1988)	- Maximum metals loading rates
Solid Waste Management Rules and Regulations -	
Section 275:"Standards for Land Application of Sewage Sludge Waste Disposal".	- Application and storage of optional sludge
Section 273: Standards for Municipal Waste Landfills	- Cover and vegetation

C. Cost-effectiveness

The selected remedy provides overall effectiveness commensurate to its costs such that it represents a reasonable value for the money.

D. Utilization of permanent solutions employing alternative technologies to the maximum extent practicable

The selected remedy is the most appropriate solution for this operable unit and represents the maximum extent to which permanent solutions and treatment can be practicably utilized.

E. Preference for treatment as a principal element

The preference is satisfied since treatment of the operable unit's principal threats (i.e., cadmium, zinc) were found to be practicable.

APPENDIX A

Aquashicola Creek, Lehigh River Comparisons with NEIC
May 1979 Data

Site Location	Sampler	Date	pH	Total Cadmium (mg/l)	Total Manganese (mg/l)	Total Lead (mg/l)	Total Zinc (mg/l)
AW-27	REWAI	3/13/86	7.27	0.013	0.14	ND	0.30
AW-27	REWAI	8/14/86	8.28	ND	0.03	0.009	0.26
AW-27	NEIC	5/79	7.00	0.001	0.04	0.004	0.03
AW-25	REWAI	3/13/86	7.31	0.011	0.14	ND	0.39
AW-25	REWAI	8/14/86	6.93	0.008	0.16	ND	0.63
AW-25	NEIC	5/79	7.15	--	--	--	--
AW-24	REWAI	3/13/86	7.07	0.008	0.09	ND	0.41
AW-24	REWAI	8/13/86	7.98	ND	0.24	0.021	0.48
AW-24	NEIC	5/79	6.94	0.007	0.21	0.003	0.52
AW-21	REWAI	3/12/86	7.02	0.018	0.11	ND	0.48
AW-21	REWAI	8/13/86	7.04	0.023	0.21	ND	1.09
AW-21	NEIC	5/79	7.12	0.040	0.25	0.004	0.86
AW-20	REWAI	3/12/86	7.22	0.013	0.06	0.005	0.51
AW-20	REWAI	8/13/86	7.12	0.031	0.28	0.012	1.14
AW-20	NEIC	5/79	7.54	0.040	0.19	0.009	0.75
LR-1	REWAI	3/14/86	6.80	0.008	0.20	0.005	0.33
LR-1	REWAI	8/15/86	6.78	ND	0.15	ND	0.21
LR-1	NEIC	5/79	6.88	0.001	0.15	0.001	0.08
LR-2	REWAI	3/14/86	6.83	0.018	0.15	ND	0.25
LR-2	REWAI	8/15/86	7.09	ND	0.08	ND	0.21
LR-2	NEIC	5/79	6.66	0.002	0.13	0.004	0.08

-- No Data
ND - Not Detected

AWQC* (ug/l)

Cadmium	Zinc	Lead
1 day = 3.9	1 day = 120	1 day = 83
4 day = 1.1	4 day = 110	4 day = 3.2

* hardness dependent criteria based upon average hardness of 100 mg/l $CaCO_3$

Mass Loading Data for Aquashicola Creek

March 1986

Site Location	Flow (MGD)	Cadmium lbs/day	Copper lbs/day	Lead lbs/day	Manganese lbs/day	Zinc lbs/day
AW-27	226.14	24.52	169.74	0	264.84	565.80
CBRO	2.30	0.03	0.21	0.02	0.26	4.39
AW-25	156.16	14.33	65.12	0	192.33	587.93
AW-24	133.82	8.99	44.38	0	99.84	454.95
NJZOF	2.62	0.90	2.47	1.70	4.47	39.88
AW-21	196.85	29.43	114.45	0	179.86	784.83
STP	1.44	0.36	0.84	0	3.72	22.58
AW-20	218.96	23.74	73.35	9.13	109.57	931.32

August 1986

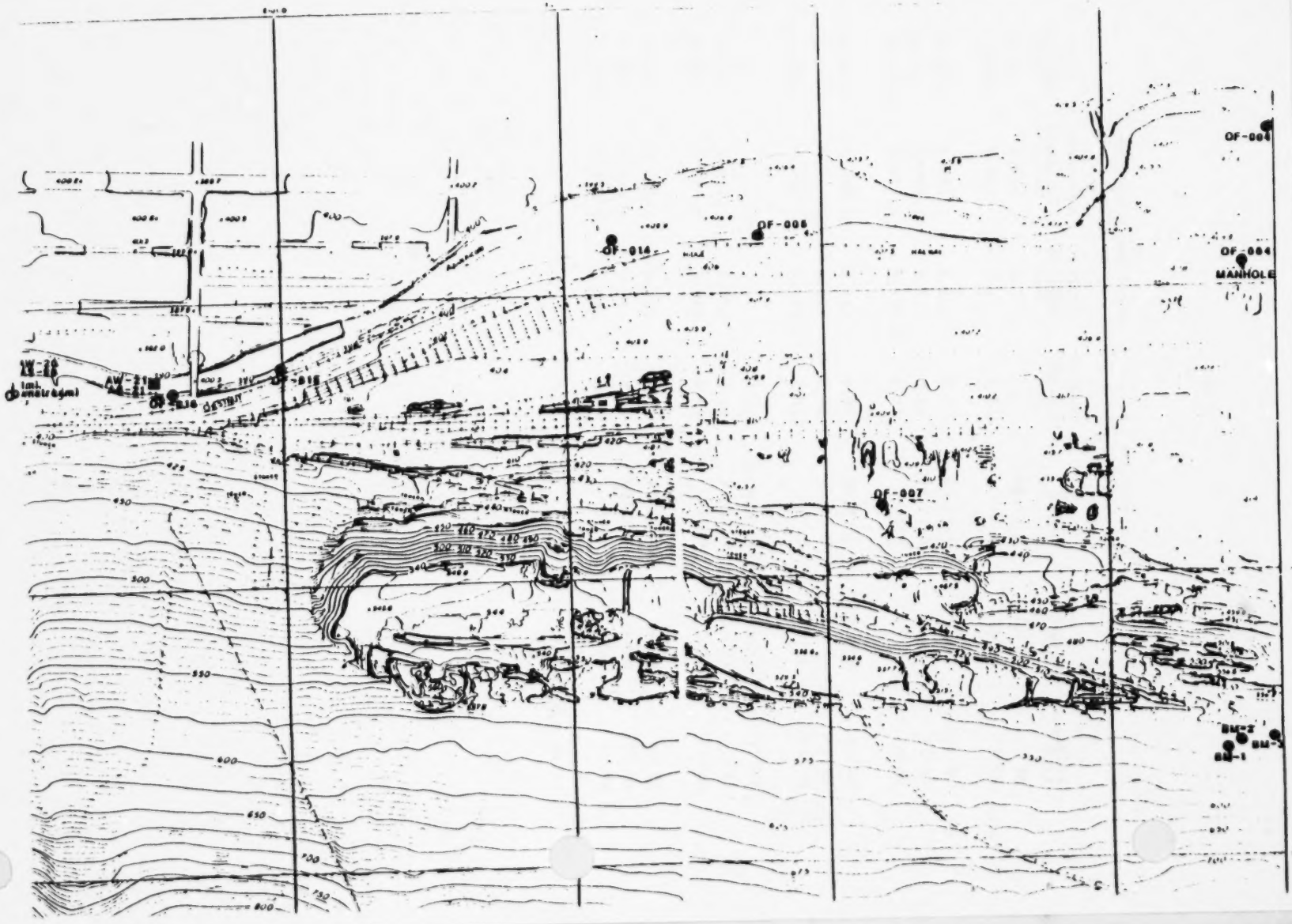
Site Location	Flow (MGD)	Cadmium lbs/day	Copper lbs/day	Lead lbs/day	Manganese lbs/day	Zinc lbs/day
AW-27	25.16	0	0.39	1.89	6.30	54.56
CBRO	0.45	0.08	0.13	0.01	0.18	4.75
AW-25	26.01	1.74	4.34	0	34.71	136.66
AW-24	25.28	0	6.33	0	58.86	181.20
NJZOF	3.61	0.92	0.65	0.87	2.69	28.46
AW-21	37.03	7.10	15.44	0	64.85	336.62
STP	1.44	0.29	0.48	0.1	3.36	11.89
AW-20	50.47	13.85	151.53	5.85	117.86	479.85

CBRO - Cinder Bank Runoff Sites
NJZOF - New Jersey Zinc Outfall Sites
STP - Palmerton Sewage Treatment Plant (loads based on estimated flow)

Comparisons of Aquashicola Creek Sediments
May 1979/March and August 1986

Site Location	Sampler	Date	Cadmium (mg/kg)	Copper (mg/kg)	Manganese (mg/kg)	Lead (mg/kg)	Zinc (mg/kg)
AS-27	REWAI	3/13/86	10.0	34.5	315.0	78.5	730.0
AS-27	REWAI	8/14/86	1.3	12.0	165.0	11.3	2.5
AS-27	NEIC	5/79	13.0	57.0	550.0	52.0	840.0
AS-25	REWAI	3/13/86	37.5	148.0	1,165.0	234.0	2,750.0
AS-25	REWAI	8/14/86	44.0	137.0	21,000.0	134.0	73.3
AS-25	NEIC	5/79	39.0	1,300.0	5,400.0	1,000.0	6,200.0
AS-24	REWAI	3/13/86	95.0	695.0	52,000.0	765.0	23,600.0
AS-24	REWAI	8/13/86	15.1	365.0	12,600.0	121.0	3,750.0
AS-24	NEIC	5/79	120.0	500.0	15,500.0	820.0	17,000.0
AS-21	REWAI	No Sample	--	--	--	--	--
AS-21	REWAI	8/13/86	42.1	174.0	7,350.0	183.0	8,670.0
AS-21	NEIC	5/79	58.0	368.0	9,700.0	870.0	14,000.0
AS-20	REWAI	3/12/86	64.5	166.0	3,600.0	413.0	9,000.0
AS-20	REWAI	8/13/86	29.5	54.7	4,080.0	88.7	4,670.0
AS-20	NEIC	5/79	95.0	380.0	9,900.0	490.0	11,000.0

-- No Sample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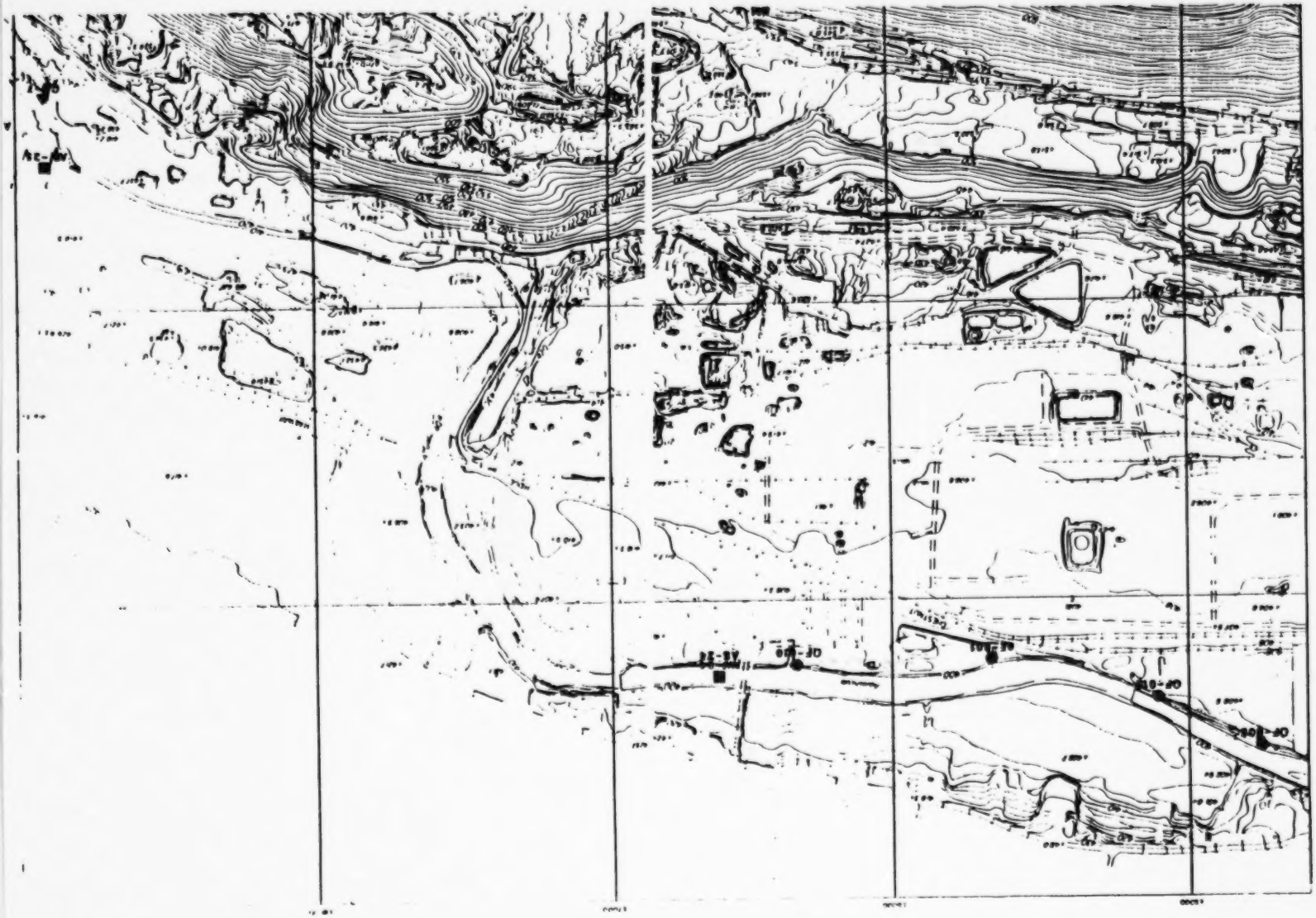
OF-014
OF-004
MANHOLE
AW-21
OF-007
BH-2
BH-1



APPENDIX B

FINAL RESPONSIVENESS SUMMARY
PALMERTON ZINC SUPERFUND SITE
OPERABLE UNIT 2: THE CINDER BANK

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Waste Programs Enforcement
Washington, D.C. 20460

Work Assignment No.	:	772
EPA Region	:	III
Site No.	:	3P26
Contract No.	:	68-01-7331
CDM Federal Programs Corporation Document No.	:	T772-C03-CR-CEYJ-2
Prepared By	:	Booz, Allen & Hamilton Inc.
Work Assignment Project Manager	:	Kristina Stein
Telephone Number	:	(301) 951-4527
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Telephone Number	:	(215) 597-3164
Date Prepared	:	July 21, 1988

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II.	COMMUNITY INTERESTS	2
	A. Comments on the Proposed Remedy	2
	B. Remaining Concerns	4

INTRODUCTION

In accordance with the U.S. Environmental Protection Agency's (EPA) Community Relations policy and guidance, the EPA Region III Office held a public comment period to obtain comments on the recommendations of the Remedial Investigation/Feasibility Study (RI/FS) prepared for the Palmerton Zinc Superfund site's cinder bank, Operable Unit 2. The opportunity for a public meeting was provided, but no interest was expressed in having one. The public comment period ran from May 16, 1988 to June 14, 1988.

The following responsiveness summary was prepared by Booz, Allen & Hamilton Inc., a subcontractor to CDM Federal Programs Corporation, under contract to Region III to provide community relations support. The community relations background section of the paper summarizes the community relations activities that have recently taken place at the site. The summary of public comments was developed from written comments received by Patricia Tan and Nanci Sinclair during the public comment period. The written comments will be placed in the public record.

I. COMMUNITY RELATIONS BACKGROUND

In meeting its public outreach responsibilities under the Superfund program, community relations activities at the Palmerton Zinc Superfund site have been ongoing. In May 1988, a revised Community Relations Plan (CRP) was prepared, a Proposed Remedial Action Plan for the cinder bank was prepared and circulated, a Public Notice of the public comment period was printed, and the opportunity for a public meeting was provided. The public comment period ran from May 16, 1988 to June 14, 1988. In addition to these activities concerning the cinder bank, a number of community relations activities have been conducted for the other operable units at the site.

II. COMMUNITY INTERESTS

Overall, there has been little interest in the cinder bank. Much of the interest has been directed to Operable Unit 1 and Operable Unit 3, the Blue Mountain and the Valley, respectively.

During the public comment period on the proposed remedial action for the cinder bank, EPA received two written comments from local residents and a written comment from the Board of Supervisors of Lower Towamensing Township. EPA also received one telephone call from a concerned local farmer.

In the letter dated May 18, 1988, a local resident raised several questions regarding the financial impacts of the remedial project; the safety of the drinking water and local gardens; and the use of lime to eliminate the heavy metals, lead, cadmium, and zinc from the cinder bank runoff.

In the letter dated June 4, 1988, a local resident suggested that the contamination has spread throughout the town and that the only true solution to the contaminated cinder bank is removing it. This citizen accepts EPA's proposed remedy but does not believe the remedy will resolve the entire problem.

In the letter dated June 13, 1988, the Board of Supervisors of Lower Towamensing Township commented on the recycling of materials on the cinder bank and expressed concern about the transportation routes by which the revegetation materials for Blue Mountain will be transported.

A. Comments on the Proposed Remedy

Following is a concise summary of specific questions and comments raised by the public on matters relating to the cinder bank during the comment period.

COMMENT: The Board of Supervisors of Lower Towamensing suggested that EPA has not considered the Board's interests and concerns regarding the Palmerton Zinc site.

EPA'S RESPONSE: On May 3, 1988, EPA met with the Chairman and a member of the Board of Supervisors of Lower Towamensing Township, during which the proposed remedy for the cinder bank was discussed. In addition, the written comments from the Board of Supervisors that EPA received during the public comment period were considered in EPA's decision on the proposed remedy.

COMMENT: The local resident suggested that the real purpose of the remedial project is two-fold: to remove sewage sludge and fly ash from Palmerton, Allentown, and Philadelphia, and to bring additional income to the Palmerton Zinc Company accepting the sludge and fly ash with pay.

EPA'S RESPONSE: The purpose of the remedial project is to protect public health and the environment from contamination at the cinder bank. Neither of the two factors mentioned above were considered. EPA is proposing a remedy that involves the treatment of soil with a mixture of wastewater treatment sludge and fly ash to allow for vegetation of the cinder bank.

COMMENT: Two local residents raised questions about the safety of the drinking water. The request was made that the drinking water be tested, just as the Aquashicola Creek was tested.

EPA'S RESPONSE: Test results of the Borough's drinking water supply have shown that the quality of the water meets current drinking water standards. The testing of these wells will continue.

COMMENT: The local resident raised doubts that lime application can get rid of the heavy metals, lead, cadmium, and zinc from the cinder bank runoff.

EPA'S RESPONSE: The application of large amounts of lime immobilizes the metals by forming low-solubility compounds. EPA is not, however, considering the application of lime, alone, as a remedial technology. This technology will be used as a component of a more comprehensive action aimed at controlling the runoff.

COMMENT: The local resident wants to know how deep the contamination from the runoff has seeped.

EPA'S RESPONSE: The above comment raises questions that will be addressed in the studies conducted for Area-Wide Ground Water and Surface Water, Operable Unit 4. These studies will investigate all possible areas of contamination.

COMMENT: The local resident wants to know if the proposed remedy can neutralize the effect of metals.

EPA'S RESPONSE: In-Situ Treatment requires treating the metal contamination with chemicals that reduce their mobility and/or

toxicity. With the application of large amounts of lime, the metals will be immobilized.

COMMENT: The Board of Supervisors requested that the proposed remedy allow non-hazardous materials in the cinder bank to be available for recycling.

EPA'S RESPONSE: The remedial action is designed to prevent the leaching of heavy metals into the river and ground water. Recycling of non-hazardous material at this time is not consistent with the goal of containing the heavy metals in the cinder bank. However, non-hazardous materials at the site not associated with the cinder bank can potentially be recycled.

COMMENT: Two residents expressed concern about the current operations of the East Plant. They fear that the current operations will contribute additional pollution problems onto the cinder bank.

EPA'S RESPONSE: The cinder bank has been closed as of December 1987. No additional residues may be placed there.

COMMENT: The local resident suggested that the comments raised by area citizens will go unheeded.

EPA'S RESPONSE: EPA has established the community relations program for the purpose of listening to and addressing the public concerns and interests of the site communities. Through various outreach efforts, including this responsiveness summary which will be entered into the public record, the community relations program strives to obtain information from the local citizens, provide information to the community, and involve the community throughout the remedial process. EPA interviewed local citizens and community leaders in May 1988 to seek input on their concerns and interests regarding the site.

B. Remaining Concerns

Additional concerns were raised during the public comment period that do not relate to the proposed remedy for the cinder bank. Many of these concerns will be addressed in the studies and proposed action for Operable Unit 3 and Operable Unit 4. Following is a summary of these remaining concerns.

COMMENT: A local area farmer expressed concern about the impact of the past air emissions on his farm.

EPA'S RESPONSE: This comment raises questions that will be addressed in the studies conducted for Operable Unit 3, the Valley.

COMMENT: The local resident wants to know EPA's plans for growing grass on the unseeded steep slopes of Blue Mountain. Only the

slight slopes are seeded, as reported by this citizen, and these slopes are brown. This citizen further requests that EPA conduct an inspection of the already seeded areas.

EPA'S RESPONSE: Currently, the revegetation of Blue Mountain is in the design stage. These concerns will be addressed in the near future. Periodic inspections are performed on the already vegetated portions.

COMMENT: The local resident raised the question of whether or not it is safe to grow and eat leafy vegetables.

EPA'S RESPONSE: There have been a number of studies concerning the safety of eating vegetables grown in the Borough's soil, which may have elevated levels of zinc, cadmium and lead. EPA has previously determined that home grown vegetables are safe to eat based on garden studies performed during the period of 1985 to 1987.

COMMENT: The Board of Supervisors of Lower Towamensing Township expressed concern about the transportation routes by which the revegetation materials for Blue Mountain will be transported.

EPA'S RESPONSE: The transportation routes and safety plans for revegetating Blue Mountain will be developed during the remedial design stage.

ADDENDUM

Subsequent to the public comment period and in response to an invitation from the Lower Towamensing Township Board of Supervisors, Nanci Sinclair and Patricia Tan of EPA's Region III staff attended the regular monthly Township Board meeting, held on July 5, 1988. At this meeting, the remedy for the cinder bank was discussed. Board members reiterated their concern that the remedymay exclude materials from recycling, that site information be made available to area residents, and that transportation routes be developed in coordination with Township officials. EPA responded to these concerns and, additionally, informed the Board that all site-related information is available in the information respository in the Palmerton Public Library.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Post Office Box 2063
Harrisburg, Pennsylvania 17120

Deputy Secretary for
Environmental Protection

717-787-5027

June 30, 1988

Stephen R. Wassersug, Director
Hazardous Waste Management Division
EPA Region III
841 Chestnut Building
Philadelphia, PA 19107

Re: Letter of Concurrence
Palmerton Superfund Site, Record Of Decision (ROD)

Dear Mr. Wassersug:

The Record Of Decision Declaration for the Palmerton site (attached) has been reviewed by the Department. I hereby concur with the EPA's proposed remedy, with the following conditions:

* EPA will assure that the Department is provided an opportunity to fully participate in any negotiations with responsible parties.

* The Department will be given the opportunity to concur with decisions related to the design of the Remedial Action, to assure compliance with DER design specific ARARs.

* The Department will reserve our right and responsibility to take independent enforcement actions pursuant to state law.

* It is understood that: (1) the Department waiver of specific RCRA requirements, which would be applicable ARARs in this case, in lieu of an alternative which attains an equivalent standard of performance, is comparable to the SARA Section 121(d)(4)(D) exemption; and (2) therefore will not be construed by EPA to be an inconsistent application of a state ARAR pursuant to SARA Section 121(d)(4)(E) for other remedial actions.

* This concurrence with the selected remedial action is not intended to provide any assurances pursuant to SARA Section 104(c)(3).

Thank you for the opportunity to concur with this EPA Record Of Decision. If you have any questions regarding this matter please do not hesitate to contact me.

Sincerely,

Mark M. McClellan

PALMERTON ZINC PILE - PHASE II *
ADMINISTRATIVE RECORD **
INDEX OF DOCUMENTS

SITE IDENTIFICATION
Preliminary Assessment and Site Investigation Reports

1) Potential Hazardous Waste Site Investigation and Preliminary Assessment, 5/20/80. P. 1-6.

2) Potential Hazardous Waste Site Investigation, 5/28/80. P. 7-7.

3) Potential Hazardous Waste Site Investigation and Preliminary Assessment, 10/27/80. P. 8-11

4) Potential Hazardous Waste Site Inspection Report, 2/19/81. P. 12-20.

5) Memorandum to Mr. Joe Donovan, U.S. EPA, from Mr. Kenneth G. Symms, Ecology and Environment, Inc., re: concerns voiced during a meeting involving representatives from EPA Headquarters and National Enforcement Investigations Center (NEIC), 2/12/82. P. 21-25. A letter regarding cadmium toxicity and a list of the cadmium-related effects in humans are attached to the memorandum.

6) Report: Site Inspection/Sampling of New Jersey Zinc Company, Palmerton, Pennsylvania, TDD No. F3-8101-20, prepared by Mr. Stanley Bumble, Ecology and Environment, Inc., (undated). P. 26-72.

7) Report: A Preliminary Assessment of New Jersey Zinc Company, Palmerton, Pennsylvania, TDD No. F3-8007-28, prepared by Ecology and Environment, Inc., (undated). P. 73-110.

Disposition/NPL Ranking

1) Potential Hazardous Waste Site Tentative Disposition, 5/29/81. P. 1-3.

* For further documentation on this site, please refer to the Palmerton Zinc Pile (Blue Mountain) Administrative Record.

** Administrative Record available 4/25/88.

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REMEDIAL ENFORCEMENT PLANNING
Signed Orders

1) Administrative Order by Consent between Horsehead Industries, Inc., and its Division, The New Jersey Zinc Company, Gulf & Western Industries, Inc., and the United States Environmental Protection Agency, 9/12/85. P. 1-23.

REMEDIAL RESPONSE PLANNING

Work Plans

1) Report: Palmerton Zinc Remedial Investigation/Feasibility Study Oversight for EPA TES III, Work Plan, prepared by CDM Federal Programs Corporation, 5/19/87. P. 1-18.

Remedial Investigation/Feasibility Study Reports

1) Report: Remedial Investigation Report, Volumes 1-7, prepared by the New Jersey Zinc Company, Palmerton, Pennsylvania, 11/20/87. P. 1-2130. References are listed on P. 408-410, 1750, and 1855-1856.

COMMUNITY INVOLVEMENT
Community Relations Plans

1) Report: Palmerton Zinc Superfund Site, Community Relations Planning for EPA TES III Work Plan, prepared by CDM Federal Programs Corporation, 1/11/88. P. 1-4.

GENERAL GUIDANCE DOCUMENTS *

1) "Promulgation of Sites from Updates 1-4," Federal Register, dated 6/10/86.

2) "Proposal of update 4," Federal Register, dated 9/18/85.

3) Memorandum to U. S. EPA from Mr. Gene Lucero regarding community relations at Superfund Enforcement sites, dated 8/28/85.

4) Groundwater Contamination and Protection, undated by Mr. Donald V. Feliciano on 8/28/85.

5) Memorandum to Toxic Waste Management Division Directors Regions I-X from Mr. William Hedeman and Mr. Gene Lucero re: Policy on Floodplains and Wetlands Assessments for CERCLA Actions, 8/6/85.

6) Guidance of Remedial Investigations under CERCLA, dated 6/85.

7) Guidance on Feasibility Studies under CERCLA, dated 6/85.

8) "Proposal of Update 3," Federal Register, dated 4/10/85.

9) Memorandum to Mr. Jack McGraw entitled "Community Relations Activites at Superfund Sites - Interim Guidance," dated 3/22/85.

10) "Proposal of Update 2," Federal Register, dated 10/15/84

11) EPA Groundwater Protection Strategy, dated 9/84.

12) Memorandum to U.S. EPA from Mr. William Heckman, Jr. entitled "Transmittal at Superfund Removal Procedures - Revision 2," dated 8/20/84.

13) "Proposal of Update 1," Federal Register, dated 9/8/83.

14) Community Relations in Superfund: A Handbook (interim version), dated 9/83.

15) "Proposal of first National Priority List," Federal Register, dated 12/30/82.

16) "Expanded Eligibility List," Federal Register, dated 7/23/82.

17) "Interim Priorities List," Federal Register, dated 10/23/81.

18) Uncontrolled Hazardous Waste Site Ranking System: A User's Manual (undated).

19) Field Standard Operating Procedures - Air Surveillance (undated).

20) Field Standard Operating Procedures - Site Safety Plan (undated).

* Located in EPA Region III office.